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Signed R. Mahoney

Dated 27 January 2004

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1. Your reference
   COMBINED MOBILE AND CORDLESS PHONE SYSTEM

2. Patent application number
   (The Patent Office will fill in this part)
   0019189.0 — 7 AUG 2000

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*
   MR PHILLIP JARRETT
   74 ADELAIDE ROAD
   BRAMHALL
   CHESHIRE
   SK7 1LU

   Patents ADP number *(if you know it)*
   7576931001

   If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention
   COMBINED MOBILE AND CORDLESS PHONE SYSTEM

5. Name of your agent *(if you have one)*

   "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*
   AS ABOVE

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6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*
UK	GB 0001754.1	27/01/00

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
   a) any applicant named in part 3 is not an inventor, or
   b) there is an inventor who is not named as an applicant, or
   c) any named applicant is a corporate body.
   See note (d))

   NO

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Continuation sheets of this form	
Description	8 SHEETS
Claim *(s)*	—
Abstract	—
Drawing *(s)*	~~5~~ 4 SHEETS (FIGS 1 – 6)

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature P Jarrett Date 4th AUGUST 2000

12. Name and daytime telephone number of person to contact in the United Kingdom PHIL JARRETT 0161-440 9269

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COMBINED MOBILE AND CORDLESS PHONE SYSTEM

The present invention relates to a combined mobile and cordless phone system, involving means to allow the cordless phone to selectively communicate either via a local base station of a cellular phone network or via a local-loop connection of a fixed telephone network.

Throughout the following description and claims, the words "mobile phone" and "cordless phone" are used as generic terms for any compact portable device (for example, handheld phones, wrist phones, wearable phones incorporated into clothing) suitable for personal communication of voice/sound, data and/or visual image signals via a radio link.

It is well known that both mobile and cordless phones communicate via radio links, the former with a cellular phone network and the latter with a fixed telephone network. Given a typical cordless phone is used inside and within the close vicinity of a building, it has an adequate operational range measured in tens of metres, with a normal maximum outdoor range of 100-300 metres. On the other hand, a mobile phone may be used anywhere within any cell of a cellular network and thus needs to have an operational range of up to several kilometres. It is also known that the transmission power required for radio signals approximately follows the Inverse Square Law and thus the power output of a cordless phone is typically a few percent of the maximum power output of a mobile phone.

Due to the relatively high power output of mobile phones and their frequent close proximity to the body when being used, particularly during voice communication, various concerns have been expressed alleging potentially adverse health effects due to the use of mobile phones. As a result, it has previously been proposed that means be provided to allow a low-power cordless handset to communicate with a local base station of a cellular network via a high-power mobile transponder unit. For example, Bucalo et al (US 5444778) proposed the transponder unit be incorporated within a briefcase. In fact, there are various low radiation options available to the user for storage of the mobile transponder unit: in a hand/shoulder bag, in a loose fitting jacket pocket, or, even located on a belt clip (if the transponder unit incorporates a suitable personal radiation shield).

Although the described communication system has the potential to overcome any possible health concerns of the user, the necessary components represent a substantial cost increase when compared to a stand-alone mobile phone, given it is necessary to provide the user with a cordless phone handset plus a mobile transponder unit. In view of this, the described prior art system has so far not been made available on a commercial basis.

Grant (GB 2340691) states that, if conventional cordless phone technology is used for communication between the cordless phone handset and the transponder unit, then the cordless phone handset can alternatively communicate with a fixed telephone network if a cordless phone base station is included within the system. However, in the system proposed by Grant, the handset and base station form the components of a conventional cordless phone system. In other words, the base station has to incorporate a radio transceiver for communication with the handset (in addition to a suitable fixed telephone network interface).

According to the present invention, the mobile transponder unit is physically connected to a cordless phone base station and, hence, it is not necessary for the latter to incorporate a radio transceiver. In other words, the system provides similar functionality to typical stand-alone mobile and cordless phone systems but at a comparable overall cost. In view of this, one objective of the combined mobile and cordless phone system is to provide low cost means for communication between the cordless phone and a local-loop connection of a fixed telephone network.

A second objective is to provide a charger for the respective battery packs of the cordless phone and the mobile transponder unit.

A third objective is to provide a combined mobile and cordless phone system having a single personal contact telephone number.

A typical local-loop landline connection provides the user with a bandwidth of up to 64 kbit/s, which compares to current Second Generation (2G) cellular network connections as low as 9 kbit/s. Even allowing for planned 3G cellular network developments, due to both technical and commercial factors, a fixed telephone network is still likely to provide the user with a more consistent higher bandwidth signal at a lower tariff rate (cost/kbit basis). For these reasons,

although the trend towards mobile communication continues to increase at an exponential rate, when at home or in the office, the use of a fixed telephone network remains preferable for the foreseeable future.

Some specific embodiments of the present invention will now be described, as examples, with reference to the accompanying drawings:-

Figs 1a and 1b show the block diagrams of a typical prior art system, where the cordless phone is able to communicate via the mobile transponder unit with a local base station of a cellular phone network and can alternatively communicate via a direct radio link with a cordless phone base station;

Fig 2 shows the block diagram of one embodiment of the present invention, where the cordless phone is able to communicate with a cordless phone base station when the mobile transponder is physically connected to the latter;

Fig 3 shows the block diagram of a second embodiment of the present invention, where the charger, for the respective battery packs of the cordless phone and the mobile transponder unit, is incorporated within a cordless phone base station which also contains a voicemail unit;

Fig 4 shows the block diagram of a typical commercially available stand-alone cordless phone system;

Fig 5 shows the block diagram of a typical commercially available stand-alone mobile phone system;

Fig 6 shows the block diagram of a third embodiment of the present invention, where a PSTN (Public Switched Telephone Network) interface is physically integrated within the mobile transponder unit and thus the latter can function as the cordless phone base station.

Referring to the prior art shown in Fig 1a, a cordless phone 1 transmits and receives via internal antenna 2, passing low powered signals 3 to and from the mobile transponder unit 5 via internal antenna 4. On the other hand, the mobile transponder unit 5 communicates with a cellular

network base station 8 via external antenna 6, transmitting and receiving the high powered signals 7.

Referring to Fig 1b, the cordless phone 1 can alternatively transmit and receive via internal antenna 2, passing low power signals 3 to and from a cordless phone base station 26.

The phone 1 and transponder 5 incorporate existing cordless and mobile phone technology, each powered by their respective rechargeable battery packs. For example, phone 1 might use technology based on the DECT cordless phone standard to communicate with transponder 5 or selectively communicate with cordless phone base station 26. On the other hand, the transponder 5 might incorporate technology based on the widely used GSM mobile phone standard to communicate with the cellular base station 8. In Europe, GSM networks make use of the 900 MHz and/or 1800 MHz frequency bands; whereas, in North America, the 1900 MHz frequency band is often employed.

A normal cordless phone based on DECT technology has an indoor range of 10-50 metres and an outdoor range of up to 300 metres, which involves a higher power level for communication signal 3 (in Figs 1a and 1b) than is strictly necessary to realise a practical embodiment of the prior art. For example, an indoor radio signal range of say 10 metres would be adequate for most applications, which is typically used at the physical level of the Bluetooth Specification for wireless communications (operating in the ISM band at 2.4 GHz). Bluetooth is already used by at least one mobile phone manufacturer to communicate with a hands free microphone headset, providing Bluetooth/GSM communication via existing technology.

Both the DECT and GSM standards make use of TDMA (Time Division Multiple Access) digital radio technology, as do the D-AMPS and PDC standards which provide further alternative options for use within the described communication system. Also, analogue embodiments of the prior art are possible, for example, based on the AMPS, ETACS, or, NMT standards which remain in use in some geographical areas of the world.

At the present time, new network infrastructures and handsets based on so-called Third Generation (3G) systems are being developed to provide enhanced communications within cellular networks. Wireless technologies such as EDGE, GPRS and W-CDMA followed by the

evolution of UMTS thus provide further options for future inclusion within the described prior art system.

Referring to Fig 2, the cordless phone 1 again transmits and receives via internal antenna 2, passing low powered signals 3 to and from the mobile transponder unit 5 via internal antenna 4. However, instead of communicating via a cellular network base station, the mobile transponder unit has been inserted into its docking station (comprising items 12, 14 and 15) within the cordless phone base station 19. The mobile transponder unit 5 is thus physically connected via multi-way connector 12 to the PSTN interface 9 and thus the cordless phone forms an essential working component of the base station 19. The signals 3 pass via transponder 5 through the PSTN interface 9 and cable 10 connected to a local-loop socket 11 and hence via a fixed telephone network.

Comparing Fig 1a with Fig 2, the combined mobile and cordless phone system described in Fig 2 thus allows the user to select either communication route according to the location of mobile transponder unit 5.

Referring again to Fig 2, cordless phone 1 and mobile transponder 5 are separately powered by rechargeable battery packs (not shown). The latter may be charged using a small portable transformer/rectifier (similar to the type commonly provided for the re-charging of existing commercially available mobile phones) which is contained within the power plug 16 passing a dc supply via cable 17 and connector 18 inserted into the cordless phone base station 19. If the battery packs of the cordless phone 1 and the mobile transponder unit 5 are of the same type and voltage, they may simply be connected in parallel across the transformer/rectifier dc output via their respective connectors 13 and 14.

The above battery charging arrangement has the advantage that the transformer/rectifier power plug 16 plus its dc supply cable 17 can optionally be unplugged from base station 19. The power plug 16 can then be used for mobile recharging of the battery packs of cordless phone 1 and transponder unit 5, for example, via a set of flexible parallel connection leads (not shown).

The transponder unit 5 can determine if it has been inserted into the base station 19 by, for example, by detecting a fixed telephone network voltage via PSTN interface 9 when cable 10 h

has been connected to a local-loop socket 11. If the fixed telephone network voltage is detected, then any outgoing calls pass via multi-way connector 12 via PSTN interface 9; on the other hand, if the mobile transponder unit 5 does not detect its physical connection to PSTN interface 9, then the signals pass via antenna 6.

When the mobile transponder 5 is connected to PSTN interface 5 and, if the local-loop telephone number has been user pre-programmed into transponder 5, the latter will advise via antenna 6, the Cellular Network Control Centre to automatically divert (subject to network provision) any incoming calls to the user pre-programmed telephone number.

On the other hand, the PSTN interface can be user pre-programmed to automatically divert incoming calls (subject to network provision) made to the local-loop telephone number to the mobile phone number, when transponder unit 5 is disconnected from PSTN interface 9. For example, the latter may be detected by activation of a microswitch 15 within the cordless phone base station 19.

In this way, the combined mobile and cordless phone system as described provides the facility for a single personal contact telephone number, namely, the mobile phone number.

Referring to Fig 3, battery charger 22 is connected to ac power supply 21 and is shown recharging the respective battery packs (not shown) associated with cordless phone 1 and mobile transponder unit 5. The battery charger 22 incorporates a transformer and rectifier to provide a dc output for the respective battery packs via connectors 13 and 14.

The voicemail unit 20 shown connected to PSTN interface 9 is powered by the battery charger 22. For example, during periods when the mobile transponder 5 is disconnected from PSTN interface 9, the voicemail unit 20 will answer any incoming calls via the local-loop socket 11, after the user pre-set number of rings.

As described for the previous embodiment (Fig 2), Fig 3 also shows a microswitch 15 which allows the base station 23 to detect when the mobile transponder 5 has been removed from its docking station (comprising items 12, 14 and 15).

During this period, to avoid the possibility of accidental de-activation of any automatic phone divert, the detection circuit associated with microswitch 15 can have a time delay of say 5-10 seconds. In this way, short period tampering with microswitch 15 of a few seconds only will not be detected.

Referring both to Fig 2 and Fig 3, for reasons of clarity, microswitch 15 is shown in direct contact with transponder unit 5. However, the charger connection 14 may be spring-loaded (similar to a convention cordless phone base station) and thus the microswitch 15 can be associated with item 14.

Referring to prior art Fig 4, the cordless phone base station 26 comprises radio transceiver 24 having internal antenna 25, PSTN interface 9 and charger 22 for re-charging the battery pack of cordless phone 1 via connectors 13, during periods when the cordless phone 1 is in physical contact (not shown) with base station 26. Instead, the cordless phone 1 is shown as communicating via internal antenna 2, signals 3 with the cordless phone base station 26.

Referring to prior art Fig 5, the mobile phone 27 communicates via external antenna 28, signals 7 with a cellular base station 8.

Referring to Fig 4 and Fig 5 and comparing the various components with the first described embodiment shown in Fig 2, it will be noted that radio transceiver 24 having antenna 25 (Fig 4) plus mobile phone 27 having antenna 28 (Fig 5) are essentially of similar complexity and hence cost as mobile transponder unit 5 having antennae 4 and 6 (Fig 2). On the other hand, cordless phone 1 having antenna 2 and PSTN interface 9 (Figs 2 and 4) represent the same block diagram components; whereas, power plug charger 16 (Fig 2) approximately equates to battery charger 22 (Fig 4). In other words, the combined mobile and cordless phone system (shown in Fig 2) has a similar overall manufacturing cost to the combined cost of the stand-alone cordless and mobile phone systems (shown in Figs 4 and 5, respectively).

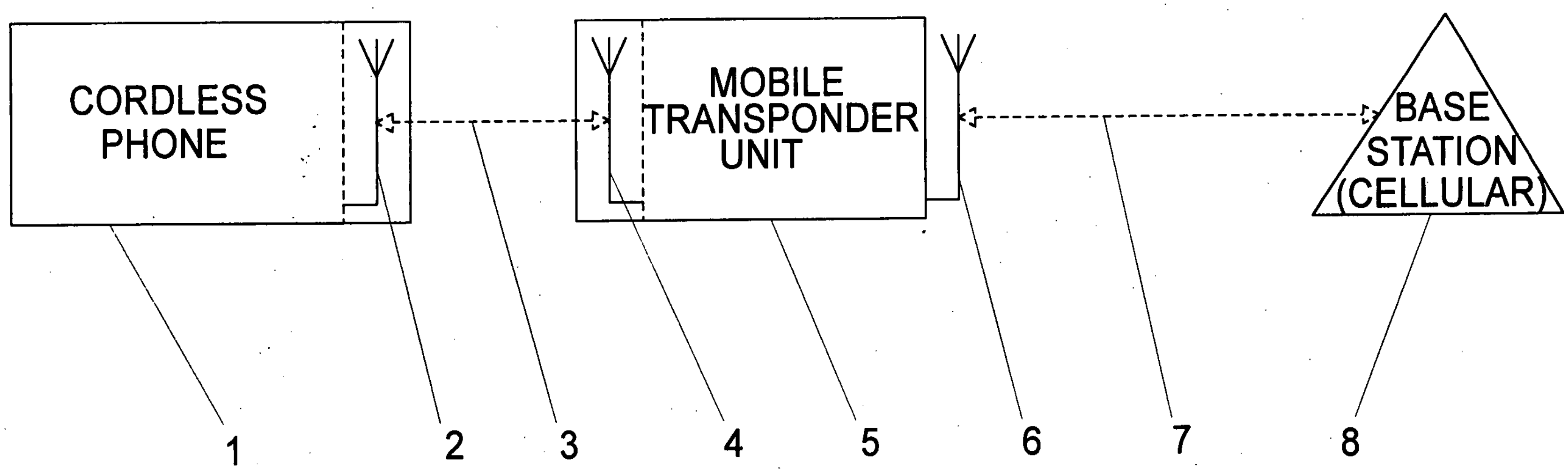
Referring to Fig 6, mobile transponder unit 5 not only contains the DECT and GSM transceivers 31 and 32, respectively, but also PSTN interface 9 allowing the transponder unit 5 to be physically connected to local-loop socket 11 via cable 10. In other words, the mobile transponder unit 5 can selectively function as a cordless phone base station.

For periods when the mobile transponder unit 5 is disconnected from local-loop socket 11, a fixed phone 30 may also be connected to socket 11 via cable 29.

Referring again to Fig 2 and 3 as well as Fig 6, one or more of the described options (namely, call divert, use of voicemail, or, parallel installation of a fixed phone) ensures a caller does not obtain a continuous "ring-out" when the transponder unit 5 is physically disconnected.

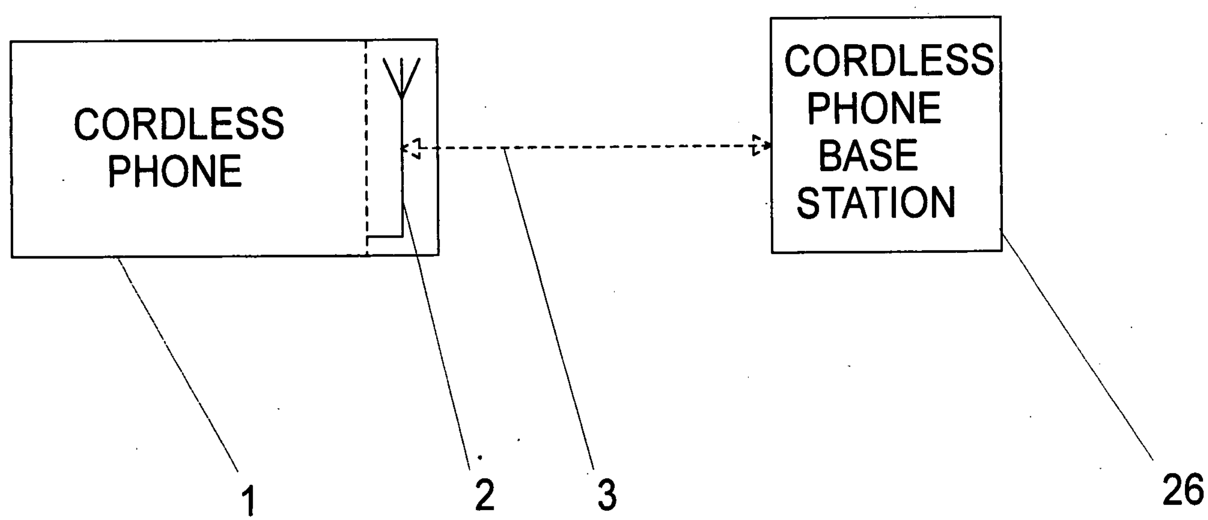
The various described cordless phone base stations are shown as containing a PSTN (Public Switched Telephone Network) interface for passing signals via a local-loop connection of a fixed telephone network. The most common type of PSTN interface is suitable for POTS, providing a "Plain Old Telephone Service" or analogue voice channel. However, it may be required to communicate data and/or visual image signals via the fixed telephone network, in which case, a suitable PSTN interface would contain a modem card or an ISDN card, depending on the type of local-loop service available. In the future, in addition digital data and/or visual image signals, there is likely to be a growing requirement for a PSTN interface suitable for providing Internet Telephony, also referred to as VOIP (Voice Over Internet Protocol).

Throughout the foregoing description and the following claims, the phrase "fixed telephone network" is used as a generic term for any non-cellular phone network and the latter can thus include both public (PSTN) and private networks. The phrase "local-loop connection" is normally understood to mean a landline connection between the customer and the local PSTN exchange and is sometimes alternatively called a Customer Access Connection (CAN), particularly in North America. In addition to use of the traditional twisted pair of copper wires for a local-loop connection, the latter may also be provided via a Cable TV (CATV) network, or, via fixed radio access technology (Wireless Access Loop). The use of an electrical power supply cable for local-loop access has also been demonstrated using Power Line Communication (PLC) technologies.



CORDLESS PHONE
MOBILE TRANSPONDER UNIT
BASE STATION (CELLULAR)
1
2
3
4
5
6
7
8

Fig 1a



CORDLESS PHONE
CORDLESS PHONE BASE STATION
1
2
3
26

Fig 1b

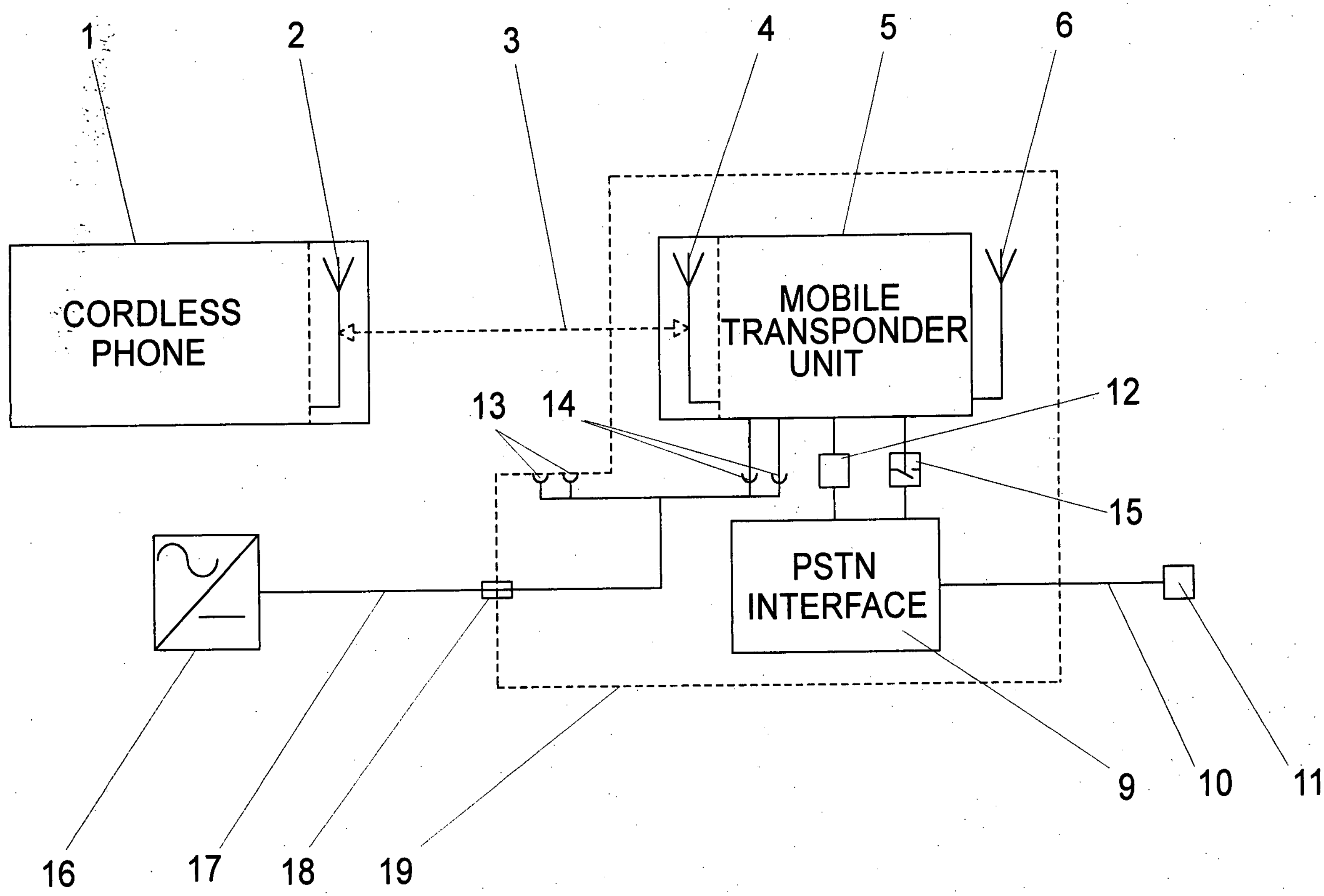

CORDLESS PHONE
MOBILE TRANSPONDER UNIT
PSTN INTERFACE
1
2
3
4
5
6
9
10
11
12
13
14
15
16
17
18
19

Fig 2

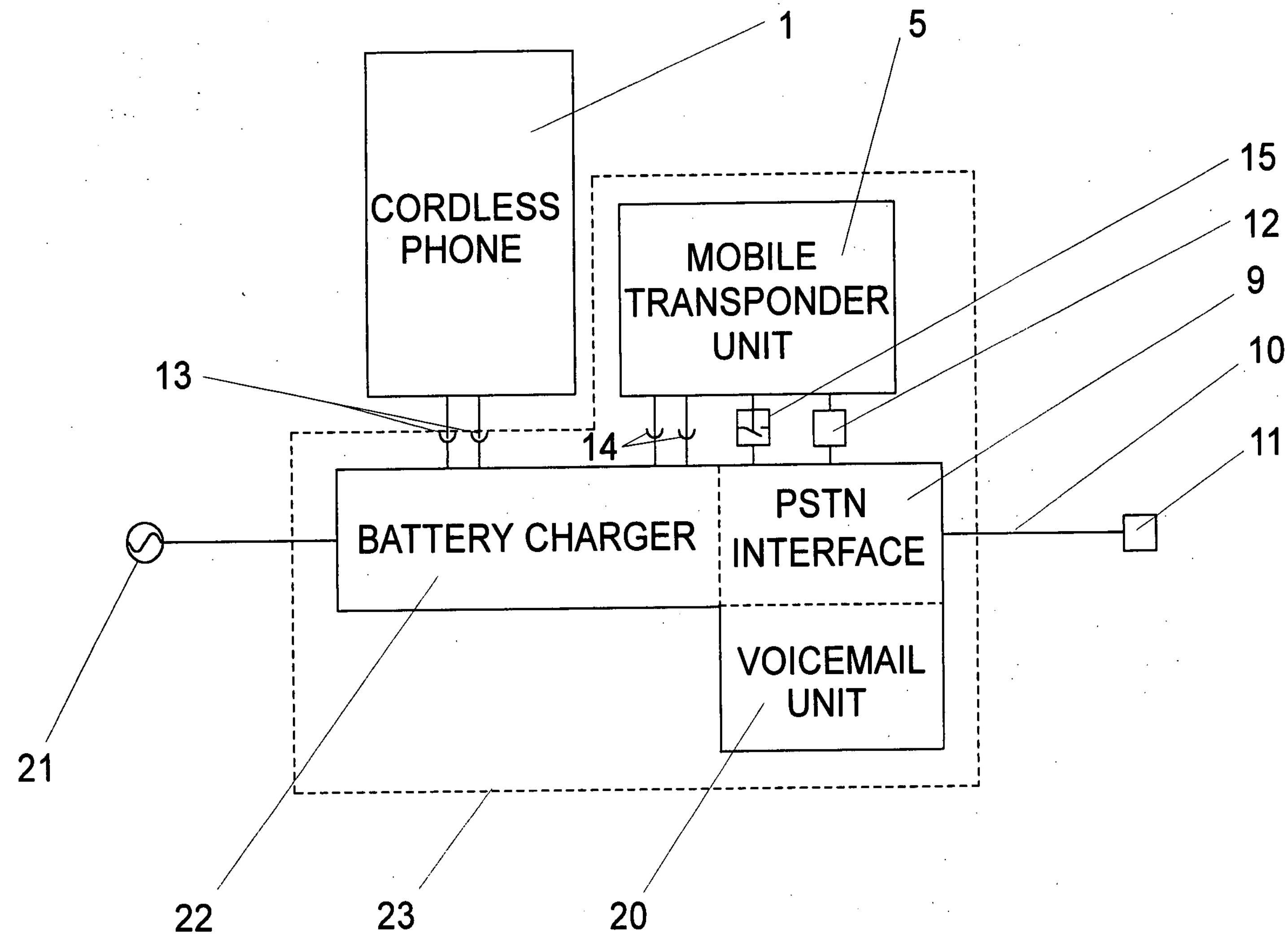

1
5
CORDLESS PHONE
MOBILE TRANSPONDER UNIT
15
12
9
10
11
13
14
BATTERY CHARGER
PSTN INTERFACE
VOICEMAIL UNIT
21
22
23
20

Fig 3

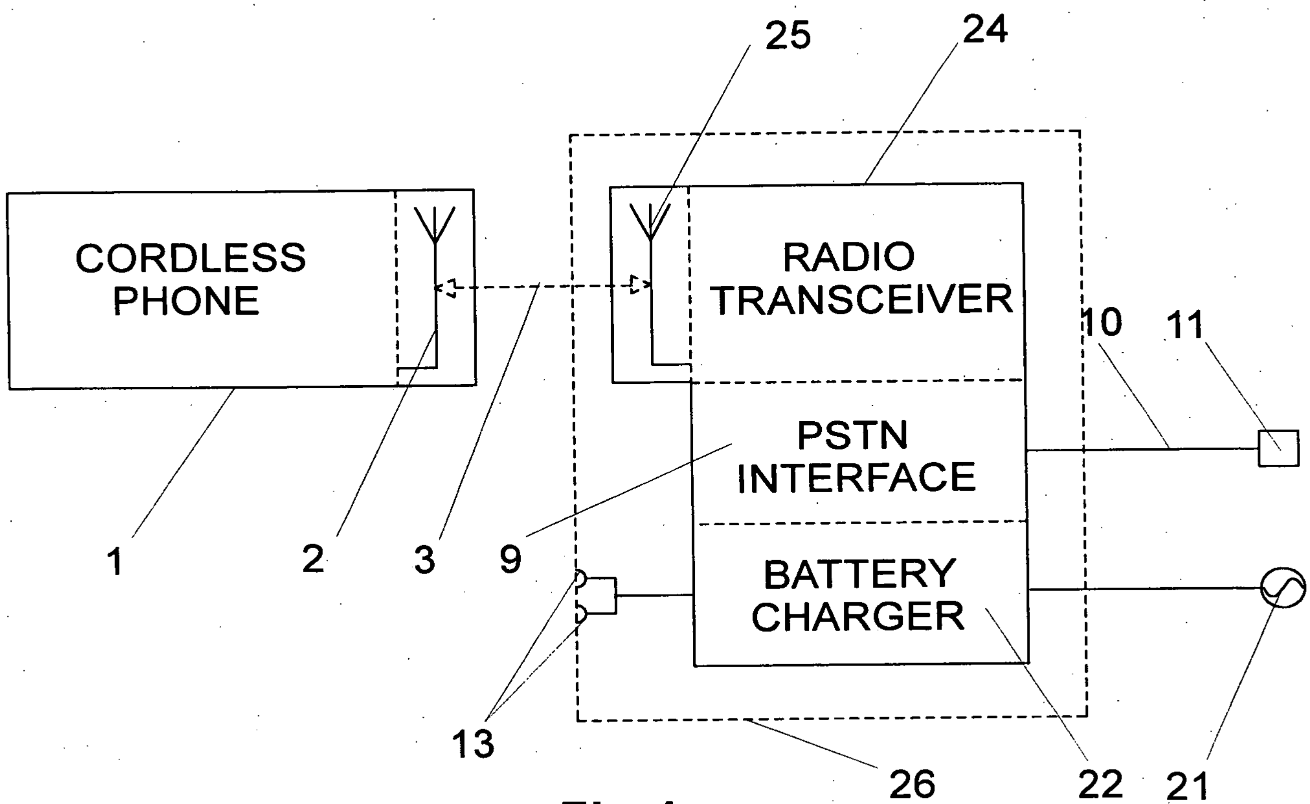

25
24
CORDLESS
PHONE
RADIO
TRANSCEIVER
10
11
PSTN
INTERFACE
1
2
3
9
BATTERY
CHARGER
13
26
22
21

Fig 4

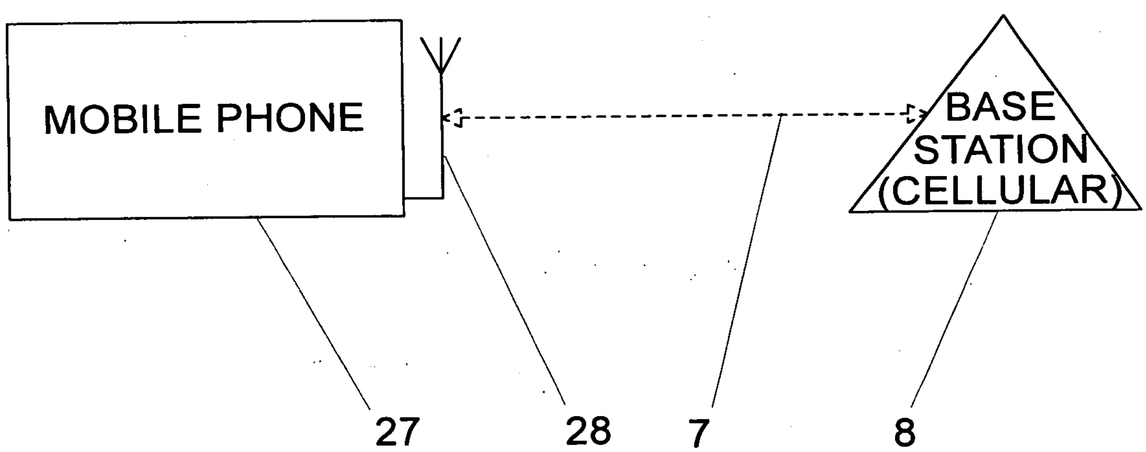

MOBILE PHONE
BASE
STATION
(CELLULAR)
27
28
7
8

Fig 5

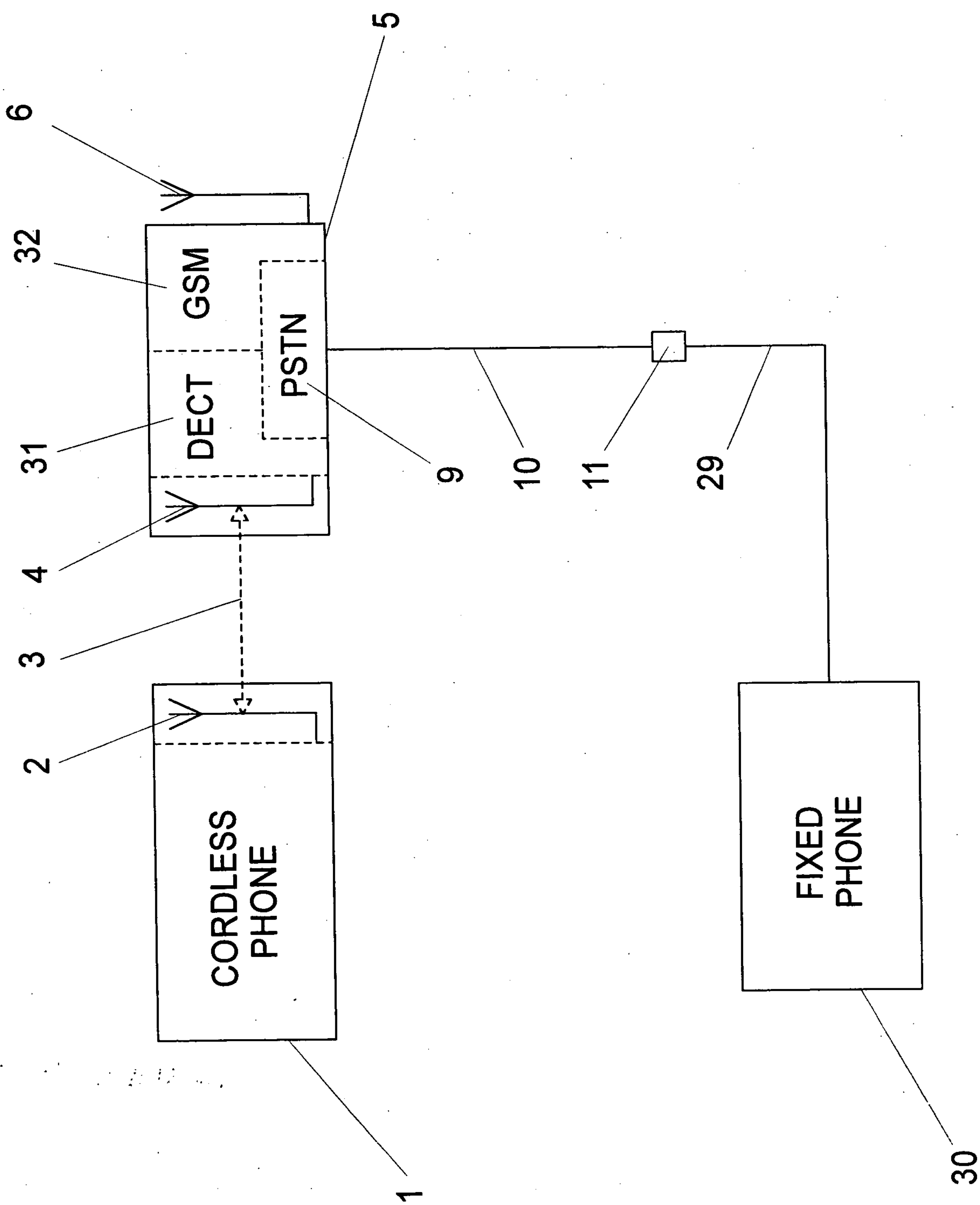

CORDLESS PHONE
DECT
GSM
PSTN
FIXED PHONE
1
2
3
4
5
6
9
10
11
29
30
31
32

Fig 6